REMARKS

In the Office Action, claims 1-24 were rejected. By the present Response, claims 1, 15 and 20 are amended and claim 22 has been canceled. Upon entry of the amendments, claims 1-21 and 23-34 will remain pending in the present patent application Reconsideration and allowance of all pending claims are requested.

Objections to specification

The Examiner objected to the amendment filed on December 27, 2005 under 35 U.S.C. §132(a) because it was believed to introduce new matter into the disclosure. By the present response, the specification has been amended to be compliant with the scope of the original disclosure.

Objections to drawings

The Examiner objected to the drawings under 37 C.F.R. 1.83(a) for not showing the features of claim 11. By the present response, FIG. 4 has been amended to particularly point out the features of claim 11. A new amended replacement drawing sheet is being provided with this response. Further, the specification has been amended to support the amendments to the drawings. No new matter has been added.

Rejections Under 35 U.S.C. § 102

The Office Action summarizes claims 1-4, 6-7, 12-13, 20-21, 23 and 24 as rejected under 35 U.S.C. §102(e) as being anticipated by Matsuyama et al. (U.S. Patent No. 6,920,758; hereinafter "Matsuyama"). Rejected claims 1 and 20 are independent and will be discussed in detail below.

Amended claim 1 recites a combustor and a combustor cap liner assembly including a combustor having a combustor casing and a combustion liner within the combustor casing. The combustion liner is closed at a forward end by the combustor liner cap assembly, the combustor including a cellular solid media disposed within the

combustor liner cap assembly and/or between the combustion liner cap assembly and an end cover to the combustor, and wherein the cellular solid media comprises a metal foam.

Amended claim 20 recites a combustor and a combustor cap liner assembly including a combustor having a combustor casing and a combustion liner within the combustor casing, wherein the combustion liner is closed at a forward end by the combustor liner cap assembly, the combustion liner cap assembly consisting essentially of a cellular solid media having annularly arranged burner tube openings therethrough for supporting a burner tube extending therethrough, and wherein the cellular solid media comprises an aerogel.

Applicants submit that the recited invention includes a combustor having a combustor casing and a combustor liner. A combustor liner cap assembly is secured to the combustor casing to support the forward end of the combustor liner. The cap assembly further includes a plurality of annularly arranged pre-mix burner tubes with an effusion plate at the aft end. The plurality of pre-mix burner tubes are mounted in a circular plate. Spaces are formed therebetween by the surfaces defining the burner tubes, circular plate and the optional effusion plate. The cellular media is disposed within these spaces to reduce noise during operation of the turbine. *See,* Application, paragraphs 25-26 and FIGS. 4-5. The cellular media includes metal foam or an aerogel as recited in claims 1 and 20. *See,* Application, paragraphs 28-29.

The Examiner argued that Matsuyama teaches a combustor and a combustor liner cap assembly and that the combustor includes a cellular solid media disposed within the combustor liner cap assembly and/or between the combustion liner cap assembly and an end cover to the combustor. The Examiner cited figures 1 and 2 of Matsuyama in support of the rejection.

Applicants submit that Matsuyama does not teach the cellular media being metal foam or an aerogel. Matsuyama teaches plates with holes provided in the space between adjacent premixing nozzles for shielding the sound pressure. The plates may be formed by punched metal, steel mesh work, sintered ceramic, sintered meshwork of stainless steel or heat-resisting steel. However, Matsuyama does not teach the cellular media being metal foam or aerogel.

Applicants submit that the present invention employs metal foam for absorbing pressure waves in a series of tortuous flow paths. In certain embodiments, open cell foams, hollow sphere foams, lattice block foams and linear cellular foams may be employed for reducing noise emissions. Further, pores defined by these various configurations can have one or more shapes such as ellipsoidal, polygonal, circular and so forth. Further, the present employs aerogels as the cellular media. Aerogels are particularly advantageous because the speed of sound in aerogel materials is extremely slow. Matsuyama does not teach these materials for sound suppression.

Applicants submit that the limitations of the cellular media being metal foam and aerogel were recited in original dependent claims 4, 17 and 22.

Claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over JP 11-062549 in view of Brown et al (U.S. Pub 2003/00118762, hereinafter "Brown") and under 35 U.S.C. §103(a) as being unpatentable over Matsuyama in view of Brown and/or Schelp (U.S. Patent No. 4,081,958; hereinafter "Schelp"). Furthermore, claim 4 is rejected under 35 U.S.C. §103(a) as being unpatentable over Fitts (U.S. Patent No. 5,274,991; hereinafter "Fitts") in view of Zink, Jr. et al. (U.S. Patent No. 2,964,121; hereinafter "Zink") and further in view of either Brown or Matsuyama and under 35 U.S.C. §103(a) as being unpatentable over Gettle et al. (U.S. Patent No. 5,394,786; hereinafter "Gettle") in view of any of the above applied art. Further, claims 17 and 22

are rejected under 35 U.S.C. §103(a) as being unpatentable over Gettle et al. (U.S. Patent No. 5,394,786; hereinafter "Gettle") in view of any of the above applied art.

The Examiner argued that JP'549 teaches a combustor and a combustor cap liner assembly, wherein the combustor liner is closed at a forward end by the combustor liner cap assembly and that the combustor includes a noise/vibration media with different porosities disposed within the combustor liner cap assembly. Further, the Examiner argued that Brown teaches a noise/vibration media used in turbine applications using a cellular structure. The Examiner concluded that it would have been obvious to one of ordinary skill in the art to employ the noise reduction media taught by Brown in order to enhance the noise reduction desired by JP'549.

JP'549 teaches a combustor having fuel nozzle that is characterized by the provision of *a surrounding pipe* on the upper side of the fuel nozzle along with the *acoustic material filled in between the pipe and the fuel nozzle*. Moreover, Brown teaches a turbine with an integral noise absorber. The turbine housing has an integral exhaust outlet conduit that forms part of the noise absorber. Applicants submit that it would not have been obvious for one skilled in the art to replace the acoustic material of JP'549 with the noise absorber of Brown. The motivation to combine these references is not found in either of the references. Furthermore, JP'549 and Brown even in combination teach noise attenuation in the premixer hot section and do not teach having the cellular media such as metal foam or aerogel for achieving noise attenuation for cap and the inlet flow area where the temperatures are less than the premixer hot section as claimed in the present invention.

Similarly, Matsuyama, Brown and Schelp even in combination do not teach the claimed structure of metal foam or aerogel disposed in the cap and inlet flow area for noise attenuation. As discussed earlier, Matsuyama does not teach metal foam or aerogel as the cellular media. Further, Brown teaches the use of such material in a hot section

such as exhaust outlet conduit of turbine. In addition, Schelp does not teach the cellular media being disposed within the combustor liner cap assembly. Rather, Schelp teaches a porous ceramic disc for dividing a flame tube to provide uniformity to the air-fuel vapor mixture for reducing the high local reaction temperature. Applicants observe first that it would not have been obvious for one skilled in the art to employ the noise absorber material of Brown in Matsuyama. Further, even in combination, these references do not teach having the cellular media such as metal foam or aerogel for achieving noise attenuation for cap and the inlet flow area. Furthermore, Schelp teaches a porous disc ceramic disc for dividing a flame tube to provide uniformity to the air-fuel vapor mixture for reducing the high local reaction temperature. Therefore, even in combination, Matsuyama and Schelp do not teach the claimed structure.

The Examiner argued that Fitts teaches the claimed combustor and a combustor liner cap assembly, and that a space is defined by opposing surfaces of a circular plate, a burner tube and an effusion plate. The Examiner acknowledged that Fitts does not teach noise attenuation in the combustor cap area. Further, the Examiner acknowledged that Fitts does not teach the solid cellular material, and relied upon Matsuyama and Brown to overcome these deficiencies. Zink was merely cited for demonstrating the use of noise insulation in an airflow region about a burner tube.

Applicants submit that Fitt teaches a modular combustion liner cap assembly for use in a multi-nozzle combustor of a gas turbine. However, Fitt does not teach noise attenuation in the combustor cap area. The Examiner relied upon Matsuyama to achieve noise attenuation via a cellular media in the combustor liner cap assembly. Applicants submit that it would not have been obvious for one skilled in the art to use the cellular media of Matsuyama in a combustor liner cap assembly. The motivation to combine these references is not found in either of the references. Furthermore, Matsuyama does not teach metal foam or aerogel as the cellular media

for noise attenuation. As described earlier, it would not have been obvious to one skilled in the art to employ the cellular media of Brown in the combustor cap assembly of Fitt or Matsuyama for achieving the noise attenuation for cap and the inlet flow area as claimed in the present invention.

Gettle teaches an attenuating assembly that employs aqueous foams and aerogels for attenuating acoustic level pressure conditions. Gettle does not teach metal foam as the noise attenuation media. Again, it would not have been obvious to one skilled in the art at the time the invention was made to combine the teachings of Gettle and the other references cited above to achieve the claimed structure.

Applicants respectfully submit that anticipation of independent claims 1 and 20 and their dependent claims cannot be supported based upon the above references, and that these claims are allowable. Applicants respectfully request the Examiner to reconsider rejection of the claims.

The Office Action also summarizes claims 1 and 2 as also rejected under 35 U.S.C. §102(b) as being anticipated by Andersson et al. (U.S. Patent No. 6,106,278; hereinafter "Andersson"). Rejected claim 1 is independent and will be discussed in detail below.

As described above, claim 1 recites a combustor and a combustor cap liner assembly including a combustor having a combustor casing and a combustion liner within the combustor casing. The combustion liner is closed at a forward end by the combustor liner cap assembly, the combustor including a cellular solid media disposed within the combustor liner cap assembly and/or between the combustion liner cap assembly and an end cover to the combustor and wherein the cellular solid media comprises metal foam.

The Examiner argued that Andersson teaches a combustor and a combustor liner cap assembly and that the combustor includes a cellular solid media disposed within the combustor liner cap assembly and/or between the combustion liner cap assembly and an end cover to the combustor.

Applicants submit that Andersson does not teach the combustor having the combustor liner cap assembly. Further, Andersson does not teach a cellular solid media being disposed within the combustor liner cap assembly and/or between the combustor liner cap assembly and an end cover to the combustor. Rather, Andersson teaches a gas turbine plant having a combustion chamber designed as an annular structure and having a combustion space. The combustion air is utilized to cool the combustion chamber via orifices of cooling ducts in a plenum. Further, the cooling ducts are extended right into the plenum and are formed inside the plenum as diffusers. At the level of the upstream end of each respective diffuser, two openings designed as slots are arranged in the burner dome. Moreover, downstream of each of the slots is a bypass duct having an orifice leading into the plenum. The combustor also *includes pressure regulating devices* designed as honeycombs arranged on the *air-inlet side in the bypass ducts. See,* Andersson, col. 4, lines 1-23.

Moreover, the required pressure loss of the bypass air is realized via the honeycombs so that the disturbances in the incident flow to the burners is avoided, which leads to improved combustion in the combustion chamber. *See,* Andersson, col. 4, lines 42-47.

Clearly, Andersson does not suggest a cellular media disposed within the combustor liner cap assembly that absorbs noise emissions and acoustic dynamics. Rather, Andersson teaches pressure regulating devices arranged in the bypass ducts for improved combustion in the combustion chamber. Furthermore, Andersson does not teach the cellular media being metal foam or aerogel as the cellular media.

Applicants respectfully submit that anticipation of independent claim 1 and its dependent claims cannot be supported based upon Andersson, and that these claims are allowable. Applicants respectfully request the Examiner to reconsider rejection of the claims.

The Office Action also summarizes claims 1 and 3 as rejected under 35 U.S.C. §102(b) as being anticipated by Schelp.

As discussed above, claim 1 recites a combustor and a combustor cap liner assembly including a combustor having a combustor casing and a combustion liner within the combustor casing. The combustion liner is closed at a forward end by the combustor liner cap assembly, the combustor including a cellular solid media disposed within the combustor liner cap assembly and/or between the combustion liner cap assembly and an end cover to the combustor and wherein the cellular solid media, comprises metal foam.

The Examiner argued that Schelp teaches a combustor and a combustor cap liner assembly and including a cellular solid media disposed within the combustor liner cap assembly. The Examiner referred to elements 32 and 36 of Schelp as the combustor liner cap assembly and the cellular solid media, respectively.

Applicants submit that Schelp does not teach the cellular media being disposed within the combustor liner cap assembly. Rather, Schelp discloses a gas turbine engine having an engine combustor. Further, a flame tube is positioned within a casing by means of an annular ring member. The flame tube is divided into an upper pre-mix or primary chamber and a lower combustion chamber by a porous ceramic disc suitably positioned within the tube by bonding. *See,* Schelp, col. 2, lines 15-27 and FIG. 2.

Applicants observe that Schelp does not teach the cellular media such as metal foam or aerogel being disposed within the combustor liner cap assembly. Rather, Schelp

teaches a porous ceramic disc for dividing a flame tube to provide uniformity to the air-fuel vapor mixture for reducing the high local reaction temperature. Therefore, Applicants submit that independent claim 1 and claims depending therefrom are allowable over Schelp, and respectfully request the Examiner to reconsider rejection of the claim.

With regard to dependent claims 2-4, 6-7, 12-13, 21 and 23-24, these claims depend directly or indirectly from allowable claims 1 and 20, and are therefore considered to be allowable at least by virtue of their dependency from an allowable base claim.

Claims 1-4, 6-11, 13, 14, 20, 21, 23 and 24 are also rejected under 35 U.S.C. §103(a) as being unpatentable over JP'549 in view of Brown. Claims 1-4, 6-10, 12-16, 18-21, 23 and 24 are rejected under 35 U.S.C. §103(a) as being unpatentable over Fitts (in view of Zink and further in view of either Brown or Matsuyama. Claims 4, 5, 17 and 22 are rejected under 35 U.S.C. §103(a) as being unpatentable over any of the applied art in view of Gettle.

Claims 1, 15 and 20 have been amended to include the recitations of the cellular media being metal foam and aerogel respectively. As discussed in the previous section, the obviousness rejection of independent claims 1, 15 and 20 and their dependent claims cannot be supported based upon the above references, and that these claims are allowable.

With regard to dependent claims 2, 6-11, 12-19, and 23-24, these claims depend directly or indirectly from allowable claims 1, 15 and 20, and are therefore considered to be allowable at least by virtue of their dependency from an allowable base claim.

Conclusion

In view of the remarks and amendments set forth above, Applicants respectfully request allowance of the pending claims. If the Examiner believes that a telephonic interview will help speed this application toward issuance, the Examiner is invited to contact the undersigned at the telephone number listed below.

Respectfully submitted,

Date: 5/24/2006

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